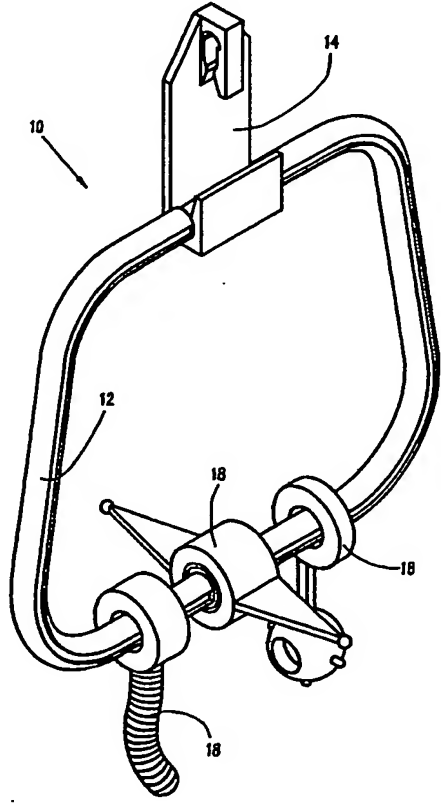


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| <p>(54) Title: IMPROVED CHICKEN TOY</p> <p>(57) Abstract</p> <p>A farm animal toy (10) including a colored structure (12, 18) suitable for stimulating at least one farm animal characterized in that the color of the colored structure is selected so as to significantly improve at least one measure of the output of at least one farm animal.</p>  | | |

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IMPROVED CHICKEN TOY
FIELD OF THE INVENTION

The present invention relates generally to toys for farm animals.

5 BACKGROUND OF THE INVENTION

Farm animals are normally kept in relatively crowded living quarters. Often, little environmental stimulation is provided. Recently, more has become known about behavioral requirements
10 of farm animals as opposed to physiological requirements about which much is known.

Layer chickens are typically quartered in cages, 2 to 10 birds per cage. The birds are known to peck at one another. Although some of the
15 pecking is harmless, some of the pecking causes physical damage and may even be fatal to the pecked bird. Normally, a hierarchy develops between the birds whereby the birds which are high within the hierarchy peck birds lower within the hierarchy.
20 The birds lowest in the hierarchy are most frequently pecked and the relatively low laying rate of these low-status birds is related to the stress they undergo due to being frequently pecked.

Toys for layer chickens are known which
25 are intended to attract pecking birds, thereby diverting attention from the lower status birds and reducing the rate of pecking at the lower status birds. The toys are also believed to be beneficial over and above the consideration of preventing

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pecking because of the general principle that environmental stimulation is advantageous for creatures having at least some intelligence.

The results of exposure to peckable toys
5 are discussed generally in United States Patent 5,010,851 to Gvaryahu et al.

Recent experiments have demonstrated that environmental stimulation is successful in reducing the aggression level of birds in a cage, in
10 increasing the total mass of eggs laid to a statistically significant extent, and in decreasing bird mortality to a statistically significant extent. These experiments are reported in the following reports:

15 "Environmental Enrichment in Laying Hens", G. Gvaryahu et al, Proc of The World's Poultry Science Association, Israel Branch, The XXVI-th Annual Convention, p. 66, Zichron Yaakov, Israel, 1988;

20 "Environment Enrichment and Contact Lenses in Laying Hens", E. Grossman et al, Proc of The World's Poultry Science Association, Israel Branch, The XXVII-th Annual Convention, p. 68, Zichron Yaakov, Israel, 1989; and

25 "The Effect of Environmental Enrichment on Egg-Layers - Final Results of Six Experiments", G. Gvaryahu et al, Proc of The World's Poultry Science Association, Israel Branch, The XXVIII-th Annual Convention, p. 75, Zichron Yaakov, Israel,
30 1990.

Agro Top Ltd., P. O. B. 2268, Rehovot 76120, presently markets AGROTOY, a pecking toy which is suspended in layer cages.

Domestic chickens (*Gallus-domesticus*)
35 have been found to prefer the purple and orange portions of the spectrum, approximately 380-480 nm and 595-625 nm, respectively, in certain contexts,

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as reported in detail in the following two publications:

Fischer, J. F., 1975. "The behavior of chickens", The Behavior of Domestic Animals, E. S. E. Hafez (Ed.), Bailliere, Tindall and Cox, London, UK, pp. 454-489;

Hess, E. H., 1956. "Natural preferences of chicks and ducklings", Psychol. Rep., 2, 477-483;

10 Ducks have also been found, in certain contexts, to prefer blue and red to other colors, as reported in Hess, E. H., 1959, "Imprinting", Science, NY, 130, 133-141.

SUMMARY OF THE INVENTION

15 The present invention seeks to provide an improved toy for farm animals.

There is thus provided in accordance with a preferred embodiment of the present invention a farm animal toy including a colored structure
20 suitable for stimulating at least one farm animal characterized in that the color of the colored structure is selected so as to significantly improve at least one measure of the output of at least one farm animal.

25 Further in accordance with a preferred embodiment of the present invention, the farm animal is a layer and the at least one measure of the output of the farm animal comprises at least one of the following group: egg weight; egg mass
30 (number of eggs x egg weight); life expectancy; and number of eggs laid.

Still further in accordance with a preferred embodiment of the present invention, the color of the colored structure is selected from
35 among colors well perceived by the farm animal.

Additionally in accordance with a preferred embodiment of the present invention, a

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substantial portion of the colored structure is blue.

Further in accordance with a preferred embodiment of the present invention, the frame of
5 the colored structure is blue.

Still further in accordance with a preferred embodiment of the present invention, the color of at least one portion of the colored structure is red.

10 Additionally in accordance with a preferred embodiment of the present invention, the color of at least one portion of the colored structure is white.

BRIEF DESCRIPTION OF THE DRAWINGS

15 The present invention will be understood and appreciated from the following detailed description, taken in conjunction with the drawings in which:

Figs. 1 and 2 are pictorial illustrations
20 of peckable toys;

Figs. 3A and 3B are conceptual illustrations of color combinations for peckable toys characterized in that the color combination of Fig. 3A is preferable over the color combination of
25 Fig. 3B;

Figs. 4A and 4B are conceptual illustrations of color combinations for peckable toys characterized in that the color combination of Fig. 4A is preferable over the color combination of
30 Fig. 4B;

Figs. 5A and 5B are conceptual illustrations of color combinations for peckable toys characterized in that the color combination of Fig. 5A is preferable over the color combination of
35 Fig. 5B;

Figs. 6A and 6B are conceptual illustrations of color combinations for peckable

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toys characterized in that the color combination of Fig. 6A is preferable over the color combination of Fig. 6B;

5 Figs. 7A and 7B are conceptual illustrations of color combinations for peckable toys characterized in that the color combination of Fig. 7A is preferable over the color combination of Fig. 7B;

10 Figs. 8A and 8B are conceptual illustrations of color combinations for peckable toys characterized in that the color combination of Fig. 8A is preferable over the color combination of Fig. 8B; and

15 Figs. 9A and 9B are conceptual illustrations of color combinations for peckable toys characterized in that the color combination of Fig. 9B is preferable over the color combination of Fig. 9A.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

20 Recent experiments reported herein indicate that a preferred color for peckable chicken toys is blue. According to a preferred embodiment, a substantial portion of the chicken toy is blue. Further in accordance with a
25 preferred embodiment of the present invention, the remaining portions of the peckable toy are blue and/or red.

Reference is made to Fig. 1 which is a pictorial illustration of a configuration for
30 a peckable toy similar to the configuration of the peckable toy marketed by Agro Top Ltd. As shown, the peckable toy 10 comprises a frame portion 12 suspended from a hanging portion 14 which may be hung on a suitable support within the
35 chicken cage such as a bar. The peckable toy 10 also comprises at least one moving part 18, which is preferably pivotably mounted on the frame 12.

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The birds peck at the moving parts 18, which may have any suitable shape so as to arouse the birds' interest. The various parts of the toy 10 may be formed of any suitable material such as
5 polypropylene.

According to a preferred embodiment of the present invention, the frame 12 is blue. Preferably, at least one moving part from among the moving parts 18, and preferably all of the moving
10 parts 18, are either blue or red or a combination thereof.

Reference is now made to Fig. 2 which is a pictorial illustration of another configuration for a peckable toy. As shown, the peckable toy 30
15 comprises a frame portion 32 which may be hung on a suitable support within a chicken cage. The peckable toy 30 also comprises at least one moving part 34. Each moving part 34 may comprise a colored bead 36 fixedly mounted on a bead support
20 portion 38 including a loop 40 which is operative to allow relatively free motion of the moving part 34 relative to the frame 32. The various parts of the toy 10 may be formed of any suitable material. For example, all parts of the toy may be formed of
25 a suitable metal apart from the colored bead, which may be formed of a suitable plastic.

It is appreciated that the peckable toy configurations illustrated in Figs. 1 and 2 are merely exemplary of possible configurations. Any
30 configuration which includes a movable part which may be arranged so as to be accessible for pecking, such that the movable part reacts to being pecked, is suitable.

Recent experiments have given the
35 following results regarding the relative effectiveness of peckable toys of various colors:

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Experiment 1: 6 Leghorn layers housed one per cage in 30 cm x 45 cm cages were exposed to toys such as the toy illustrated in Fig. 2. Three identical sequences of experimental conditions were provided. Each sequence included 6 observations, spaced 1-2 days apart. In the first observation, the 6 Leghorn layers, referenced herein layers 1-6, were exposed to blue, red, white, green, yellow and pink toys, respectively for a one-hour period. In the second observation, 1-2 days later, the 6 layers 1-6 were respectively exposed to red, white, green, yellow, pink and blue toys, for a one-hour period. Observations 3-6 were designed similarly. For example, in observation 6, layers 1-6 were respectively exposed to pink, blue, red, white, green and yellow toys, for a one-hour period.

In each of the 18 observations, the total number of pecks at the toy for each of the six layers was recorded. The 6 colors were then ranked by pecking preference. For example, a color was ranked 1 if it was pecked more than the other 5 colors.

The color preferences for each of the layers and the mean color preference over layers, where 1 indicates the highest level of preference and 6 indicates the lowest level of preference, were as follows:

Table 1:

| | LAYER | GREEN | BLUE | RED | WHITE | YELLOW | PINK |
|-------|-------|-------|------|------|-------|--------|------|
| 30 | 1 | 6 | 2.5 | 2.5 | 1 | 4.5 | 4.5 |
| | 2 | 6 | 1 | 4 | 2 | 5 | 3 |
| | 3 | 2 | 4 | 6 | 3 | 1 | 5 |
| | 4 | 5 | 1 | 2.5 | 2.5 | 6 | 4 |
| | 5 | 4.5 | 2.5 | 1 | 2.5 | 4.5 | 6 |
| 35 | 6 | 5 | 1 | 3 | 2 | 4 | 6 |
| <hr/> | | | | | | | |
| | MEAN | 4.75 | 2 | 3.17 | 2.16 | 4.17 | 4.75 |

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A one-way ANOVA performed on the mean color preferences indicated that blue and white toys were more preferred than green, yellow or pink toys, to a statistically significant extent.

5 Red toys were less preferred than blue or white toys, but not to a statistically significant extent, and were more preferred than green, yellow or pink toys, but not to a statistically significant extent.

10 Experiment 2: 6 Leghorn layers housed one per cage in 30 cm x 45 cm cages were exposed to toys such as the toy illustrated in Fig. 2, except that 4 moving parts were used instead of 3. Three identical sequences of experimental conditions were
15 provided. Each sequence included 3 observations. In the first observation, the 6 Leghorn layers, referenced herein layers 1-6, were exposed to red, white, red/white, red, white, and red/white toys, respectively, for a one-hour period. In the red
20 toys and the white toys, all beads were, respectively, red and white. In the red/white toys, two of the beads were red and two of the beads were white. In the second observation, layers 1-6 were respectively exposed to white,
25 red/white, red, white, red/white and red toys, respectively, for a one-hour period. In the third observation, layers 1-6 were respectively exposed to red/white, red, white, red/white, red and white toys, respectively, for a one-hour period. The
30 total number of pecks for each one-hour period were recorded. When red/white toys were used, the total number of pecks were recorded separately for white and red beads. The total number of pecks data was employed to rank the color preferences of the
35 layers.

The color preferences for each of the layers and the mean color preference over layers,

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where 1 indicates the highest level of preference and 3 indicates the lowest level of preference, were as follows:

Table 2:

| | | | | |
|-------|-------|-------|-----------|------|
| 5 | LAYER | WHITE | RED/WHITE | RED |
| | 1 | 1 | 2 | 3 |
| | 2 | 1 | 3 | 2 |
| | 3 | 1 | 2 | 3 |
| | 4 | 3 | 1 | 2 |
| 10 | 5 | 2 | 1 | 3 |
| | 6 | 2.5 | 1 | 2.5 |
| ----- | | | | |
| | MEAN | 1.75 | 1.66 | 2.58 |

The above results indicate that red and white toys enjoyed a higher level of preference than did white toys, and white toys enjoyed a higher level of preference than did red toys.

Experiment 3: Experiment 3 was identical to Experiment 2 except that blue toys were used instead of red toys and green toys were used instead of white toys. Red/white toys were also used, as in Experiment 2.

The color preferences for each of the layers and the mean color preference over layers, where 1 indicates the highest level of preference and 3 indicates the lowest level of preference, were as follows:

Table 3:

| | | | | |
|-------|-------|------|-----------|-------|
| | LAYER | BLUE | RED/WHITE | GREEN |
| 30 | 1 | 2 | 1 | 3 |
| | 2 | 1 | 2 | 3 |
| | 3 | 3 | 2 | 1 |
| | 4 | 1 | 3 | 2 |
| | 5 | 1 | 2.5 | 2.5 |
| 35 | 6 | 2.5 | 1 | 2.5 |
| ----- | | | | |
| | MEAN | 1.75 | 1.91 | 2.33 |

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The above results indicate that blue toys enjoyed a higher level of preference than did red/white toys, and red/white toys enjoyed a higher level of preference than did green toys.

5 Experiment 4: PBU-Yarkon layers at the end of their second laying period were exposed to peckable toys similar to the peckable toy illustrated in Fig. 1. The peckable toys were either white or colored. 50 of the colored toys had blue frames, 10 red hanging portions, and 3 moving parts which were red, blue and green, respectively. The remaining 27 colored toys had red frames, blue hangers, and 3 moving parts which were red, blue and green, respectively.

15 The layers were housed in 30 cm x 45 cm cages, 2 birds per cage. 77 cages were assigned to a control group and were not exposed to toys. 77 cages were exposed to colored toys. 70 cages were exposed to white toys. Each 7 cages corresponds to 20 a unit of observation within which mean daily egg count and mean egg weight were computed. In other words, each 14 birds formed a unit of observation and there were 11, 11 and 10 units of observation in the control, colored and white experimental 25 groups, respectively. In total, there were 32 units of observation.

The experiment took place over a period of one month. The results of the experiment were as follows:

30 Table 4:

| EXPERIMENTAL GROUP | MEAN DAILY EGG COUNT | MEAN EGG WEIGHT (GR) | MEAN DAILY FOOD CONSUMED (GR) |
|-----------------------|-------------------------|-------------------------|----------------------------------|
| Control | 5.62 | 70.55 | 114.88 |
| Colored | 5.91 | 73.34 | 114.21 |
| 35 White | 5.79 | 71.88 | 114.09 |

Raw data corresponding to the Mean Daily

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Egg Count column of Table 4 is appended hereto and is referenced Appendix A.

Raw data corresponding to the Mean Egg Weight column of Table 4 is appended hereto and is
5 referenced Appendix B.

Raw data corresponding to the Mean Daily Food Consumed column of Table 4 is appended hereto and is referenced Appendix C.

Table 4 shows that layers exposed to
10 colored toys laid more eggs per day and their mean egg weight was greater to a statistically significant extent, but they did not require more food. An ANOVA table showing the statistical significance of the results is appended hereto and
15 referenced Appendix H. In Appendix H, group 1 is the Control group, group 2 is the White group and group 3 is the Colored group.

Experiment 5: PBU-Yarkon layers at the end of their second laying period were exposed to peckable
20 toys similar to the peckable toy illustrated in Fig. 1. A first experimental group of 35 cages was exposed to peckable toys with blue frames, blue hanging portions and 3 moving parts which were respectively red, green and blue. A second
25 experimental group of 35 cages was exposed to peckable toys with red frames, red hanging portions and moving parts which were respectively red, green and blue. A first control group of 70 cages was exposed to white peckable toys. A second control
30 group of 77 cages was not exposed to any toys. Each 7 cages was a unit of observation within which mean daily egg count and mean egg weight were computed. Therefore, there were 5, 5, 10 and 11 units of observations in the first and second
35 experimental groups and in the first and second control groups, respectively, or a total of 33 units of observation.

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The layers were housed in 30 cm x 45 cm cages, 2 birds per cage. The experiment took place over a period of 18 days. The results of the experiment were as follows:

5 Table 5:

| EXPERIMENTAL GROUP | MEAN DAILY EGG COUNT | MEAN EGG WEIGHT (GR) | MEAN EGG MASS (GR) | MEAN DAILY FOOD CON- SUMED (GR) |
|-----------------------|-------------------------|-------------------------|-----------------------|---------------------------------------|
| Blue Frame | 5.89 | 74.05 | 436.2 | 105.47 |
| 10 Red Frame | 5.26 | 70.26 | 369.6 | 109.78 |
| White | 5.74 | 69.85 | 400.9 | 107.35 |
| No toy | 4.97 | 70.1 | 348.4 | 107.02 |

Raw data corresponding to the Mean Daily Egg Count column of Table 5 is appended hereto and
15 is referenced Appendix D.

Raw data corresponding to the Mean Daily Food Consumed column of Table 5 is appended hereto and is referenced Appendix E.

Raw data corresponding to the Mean Egg
20 Weight column of Table 5 is appended hereto and is referenced Appendix F.

Table 5 shows that layers exposed to blue framed toys having blue hanging portions and red, blue and green moving parts laid more eggs per day
25 and their mean egg weight was greater, to a statistically significant extent, as shown in the ANOVA table appended hereto and referenced Appendix G. In Appendix G, group 1 is the Blue group, group 2 is the Red group, group 3 is the White group and
30 group 4 is the No Toy group.

Experiment 6: Lohman layers in their first laying period were exposed to peckable toys similar to the peckable toy illustrated in Fig. 1. A first experimental group of 20 cages was exposed
35 to peckable toys with blue frames, two red moving parts and one blue moving part between the two red

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moving parts. A second experimental group of 20 cages was exposed to peckable toys with blue frames and three moving parts which were red, blue and green, respectively. A control group of 40 cages was not exposed to any toys. Each 10 cages corresponds to a unit of observation within which mean daily egg count and mean egg weight were computed.

The layers were housed in 30 cm x 45 cm cages, 3 birds per cage. The experiment took place over a period of 36 days. The results of the experiment were as follows:

Table 6:

| | EXPERIMENTAL | MEAN DAILY | MEAN EGG | MEAN EGG |
|----|--------------|------------|-------------|-----------|
| 15 | GROUP | EGG COUNT | WEIGHT (GR) | MASS (GR) |
| | Blue 1 | 28.53 | 64.61 | 1843 |
| | Blue 2 | 27.63 | 64.29 | 1785 |
| | No toy | 27.49 | 64.62 | 1776 |

The above table shows that layers exposed to blue framed toys having 2 red and one blue moving part laid more eggs per day and their mean egg mass was greater, relative to the layers in the other experimental groups.

Experiment 7: An experimental group of Lohman layers in the beginning of their second laying period were exposed to peckable toys and were compared to a control group of Lohman layers in the beginning of their second laying period which were not exposed to peckable toys, to investigate differences in layer mortality. Each group included 21 observations. Each observation was conducted as follows:

A plurality of layers, such as 10 - 18 layers, were housed 3 per cage in 30 cm x 45 cm cages. Depending on the experimental condition, the cages were or were not provided with a peckable toy. The duration of the experiment was from 13

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November 1990 to 29 July 1991. The colors of the peckable toy were as follows: blue frame, 3 moving parts which were red, blue and red, and a red hanging portion, as illustrated in Fig. 4A.

5 The results of Experiment 7 are summarized in Appendix I. In the raw data table, for each of the $21 \times 2 = 42$ observations, percent mortality appears in column 1, the experimental condition appears in column 2, the number of layers
10 as the experiment began appears in column 3 and the number of surviving layers at termination of the experiment appears in column 4.

 The ANOVA table shows that mortality was significantly increased in the experimental group
15 which was provided with peckable toys, relative to the control group which was not so provided.

 It is believed that the performance of layers exposed to a completely blue toy results is slightly less good than the performance of layers
20 exposed to a toy with a blue frame, a red hanging portion, 2 red moving parts and one blue moving part.

 It is believed that a preferred combination of colors for a peckable toy is as
25 follows: A substantial portion of the toy, such as the frame, is blue. Other portions of the toy such as the hanging portion and moving parts, may be other than blue. Preferably, approximately half of the hanging portion and moving parts is blue and
30 the remaining half is either red, blue or white. One particularly suitable combination is: blue frame, red hanging portion, two red moving parts, one blue moving part.

 Figs. 3A-9B are conceptual illustrations
35 of color combinations for peckable toys characterized in that the color combination of Figs. 3A, 4A, 5A, 6A, 7A, 8A and 9B are believed to

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be preferable in improving the output of layers, relative to the color combinations of Figs. 3B, 4B, 5B, 6B, 7B, 8B and 9A respectively. It is appreciated that the color combinations of Figs.

5 3A, 4A, 5A, 6A, 7A, 8A and 9B may be used for any suitable configuration of peckable toy. It is also appreciated that the particular toys illustrated in Figs. 3A, 4A, 5A, 6A, 7A, 8A and 9B are merely illustrative of the preferred pecking toys
10 described herein.

It is believed that the differences in layers' pecking behavior, laying performance and well-being when exposed to pecking toys of different colors is related in differences in the
15 birds' capability to perceive different colors.

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APPENDIX A

| UNIT TYPE | UNIT NO. | 24/02 | 25/02 | 26/02 | 27/02 | 28/02 | 01/03 | 02/03 | DATE |
|---------------|----------|-------|-------|-------|-------|-------|-------|-------|------|
| CONTROL | 1 | 6 | 7 | 7 | 6 | 7 | 6 | 4 | |
| WHITE | 2 | 5 | 6 | 7 | 3 | 5 | 7 | 4 | |
| COLORED | 3 | 5 | 8 | 4 | 6 | 4 | 6 | 4 | |
| CONTROL | 4 | 6 | 7 | 4 | 4 | 4 | 4 | 6 | |
| WHITE | 5 | 5 | 5 | 3 | 3 | 2 | 5 | 3 | |
| COLORED | 6 | 7 | 4 | 3 | 5 | 4 | 6 | 7 | |
| CONTROL | 7 | 7 | 5 | 5 | 3 | 9 | 5 | 5 | |
| WHITE | 8 | 3 | 5 | 1 | 8 | 5 | 4 | 3 | |
| COLORED | 9 | 2 | 4 | 3 | 6 | 3 | 4 | 5 | |
| CONTROL | 10 | 5 | 4 | 4 | 6 | 2 | 4 | 4 | |
| WHITE | 11 | 9 | 8 | 4 | 5 | 6 | 6 | 6 | |
| COLORED | 12 | 2 | 5 | 1 | 4 | 4 | 5 | 4 | |
| CONTROL | 13 | 5 | 7 | 4 | 7 | 6 | 5 | 5 | |
| WHITE | 14 | 6 | 6 | 4 | 5 | 6 | 5 | 6 | |
| COLORED | 15 | 3 | 6 | 4 | 5 | 5 | 6 | 7 | |
| CONTROL | 16 | 5 | 4 | 5 | 5 | 2 | 3 | 4 | |
| COLORED | 17 | 8 | 7 | 9 | 6 | 4 | 6 | 8 | |
| COLORED | 18 | 7 | 5 | 7 | 6 | 7 | 7 | 7 | |
| COLORED | 19 | 4 | 8 | 3 | 8 | 3 | 5 | 8 | |
| CONTROL | 20 | 9 | 7 | 6 | 4 | 5 | 5 | 8 | |
| WHITE | 21 | 5 | 7 | 9 | 7 | 2 | 6 | 5 | |
| WHITE | 22 | 6 | 7 | 5 | 2 | 4 | 5 | 5 | |
| CONTROL | 23 | 5 | 5 | 5 | 6 | 4 | 4 | 3 | |
| COLORED | 24 | 7 | 8 | 8 | 5 | 5 | 7 | 7 | |
| WHITE | 25 | 3 | 8 | 8 | 9 | 6 | 7 | 10 | |
| CONTROL | 26 | 5 | 8 | 7 | 6 | 6 | 8 | 5 | |
| COLORED | 27 | 7 | 7 | 9 | 6 | 12 | 4 | 6 | |
| WHITE | 28 | 5 | 7 | 10 | 9 | 5 | 2 | 9 | |
| CONTROL | 29 | 6 | 6 | 5 | 5 | 5 | 3 | 5 | |
| COLORED | 30 | 5 | 7 | 3 | 6 | 4 | 7 | 5 | |
| WHITE | 31 | 7 | 6 | 6 | 7 | 5 | 6 | 5 | |
| CONTROL | 32 | 11 | 6 | 7 | 9 | 7 | 6 | 11 | |
| CONTROL TOTAL | | 70 | 66 | 59 | 61 | 57 | 53 | 60 | |
| WHITE TOTAL | | 54 | 65 | 57 | 58 | 46 | 53 | 56 | |
| COLORED TOTAL | | 57 | 69 | 54 | 63 | 55 | 63 | 68 | |
| CONTROL MEAN | | 6.36 | 6.00 | 5.36 | 5.55 | 5.18 | 4.82 | 5.45 | |
| WHITE MEAN | | 5.40 | 6.50 | 5.70 | 5.80 | 4.60 | 5.30 | 5.60 | |
| COLORED MEAN | | 5.18 | 6.27 | 4.91 | 5.73 | 5.00 | 5.73 | 6.18 | |

SUBSTITUTE SHEET

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| UNIT TYPE | /UNIT NO. | 03/03 | 04/03 | 05/03 | 06/03 | 07/03 | 08/03 | 09/03 | DATE |
|---------------|-----------|-------|-------|-------|-------|-------|-------|-------|------|
| CONTROL | 1 | 9 | 6 | 6 | 7 | 5 | 6 | 8 | |
| WHITE | 2 | 6 | 5 | 4 | 7 | 6 | 4 | 3 | |
| COLORED | 3 | 7 | 4 | 7 | 8 | 6 | 4 | 6 | |
| CONTROL | 4 | 5 | 6 | 7 | 4 | 10 | 3 | 6 | |
| WHITE | 5 | 2 | 3 | 4 | 5 | 5 | 4 | 3 | |
| COLORED | 6 | 4 | 5 | 4 | 5 | 7 | 7 | 5 | |
| CONTROL | 7 | 5 | 3 | 5 | 4 | 6 | 4 | 8 | |
| WHITE | 8 | 7 | 5 | 3 | 5 | 5 | 3 | 5 | |
| COLORED | 9 | 6 | 4 | 4 | 5 | 5 | 5 | 4 | |
| CONTROL | 10 | 5 | 4 | 3 | 5 | 3 | 5 | 6 | |
| WHITE | 11 | 9 | 4 | 7 | 8 | 7 | 7 | 5 | |
| COLORED | 12 | 5 | 4 | 5 | 3 | 4 | 2 | 6 | |
| CONTROL | 13 | 7 | 8 | 2 | 6 | 8 | 6 | 8 | |
| WHITE | 14 | 4 | 4 | 8 | 6 | 3 | 7 | 5 | |
| COLORED | 15 | 6 | 6 | 8 | 8 | 7 | 4 | 8 | |
| CONTROL | 16 | 5 | 3 | 5 | 6 | 6 | 3 | 4 | |
| COLORED | 17 | 6 | 8 | 4 | 8 | 7 | 4 | 11 | |
| COLORED | 18 | 6 | 7 | 5 | 5 | 4 | 7 | 7 | |
| COLORED | 19 | 8 | 5 | 5 | 8 | 7 | 6 | 6 | |
| CONTROL | 20 | 5 | 7 | 3 | 6 | 7 | 5 | 6 | |
| WHITE | 21 | 8 | 6 | 5 | 6 | 6 | 3 | 7 | |
| WHITE | 22 | 6 | 3 | 6 | 5 | 5 | 3 | 6 | |
| CONTROL | 23 | 4 | 6 | 4 | 4 | 5 | 4 | 5 | |
| COLORED | 24 | 8 | 6 | 7 | 8 | 7 | 7 | 5 | |
| WHITE | 25 | 11 | 8 | 8 | 8 | 10 | 7 | 8 | |
| CONTROL | 26 | 6 | 5 | 5 | 6 | 9 | 6 | 5 | |
| COLORED | 27 | 8 | 7 | 7 | 8 | 5 | 8 | 6 | |
| WHITE | 28 | 9 | 6 | 9 | 9 | 7 | 8 | 6 | |
| CONTROL | 29 | 7 | 8 | 5 | 6 | 4 | 8 | 4 | |
| COLORED | 30 | 7 | 3 | 7 | 5 | 5 | 6 | 5 | |
| WHITE | 31 | 7 | 8 | 9 | 6 | 8 | 7 | 7 | |
| CONTROL | 32 | 7 | 3 | 7 | 12 | 7 | 9 | 8 | |
| CONTROL TOTAL | | 65 | 59 | 52 | 66 | 70 | 59 | 68 | |
| WHITE TOTAL | | 69 | 52 | 63 | 65 | 62 | 53 | 55 | |
| COLORED TOTAL | | 71 | 59 | 63 | 71 | 64 | 60 | 69 | |
| CONTROL MEAN | | 5.91 | 5.36 | 4.73 | 6.00 | 6.36 | 5.36 | 6.18 | |
| WHITE MEAN | | 6.90 | 5.20 | 6.30 | 6.50 | 6.20 | 5.30 | 5.50 | |
| COLORED MEAN | | 6.45 | 5.36 | 5.73 | 6.45 | 5.82 | 5.45 | 6.27 | |

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| UNIT TYPE | /UNIT NO. | 10/03 | 11/03 | 12/03 | 13/03 | 14/03 | 15/03 | 16/03 | DATE |
|---------------|-----------|-------|-------|-------|-------|-------|-------|-------|------|
| CONTROL | 1 | 4 | 8 | 8 | 6 | 6 | 6 | 7 | |
| WHITE | 2 | 7 | 6 | 4 | 5 | 5 | 6 | 7 | |
| COLORED | 3 | 5 | 8 | 5 | 4 | 6 | 8 | 6 | |
| CONTROL | 4 | 4 | 6 | 5 | 4 | 5 | 5 | 8 | |
| WHITE | 5 | 3 | 3 | 4 | 3 | 4 | 2 | 3 | |
| COLORED | 6 | 6 | 7 | 3 | 6 | 7 | 5 | 4 | |
| CONTROL | 7 | 7 | 3 | 7 | 4 | 3 | 5 | 3 | |
| WHITE | 8 | 4 | 5 | 6 | 5 | 5 | 6 | 3 | |
| COLORED | 9 | 6 | 4 | 7 | 5 | 6 | 4 | 4 | |
| CONTROL | 10 | 5 | 4 | 3 | 7 | 3 | 5 | 4 | |
| WHITE | 11 | 9 | 7 | 6 | 7 | 6 | 9 | 3 | |
| COLORED | 12 | 4 | 4 | 4 | 4 | 3 | 3 | 2 | |
| CONTROL | 13 | 7 | 5 | 6 | 6 | 8 | 5 | 5 | |
| WHITE | 14 | 6 | 9 | 5 | 6 | 8 | 5 | 5 | |
| COLORED | 15 | 8 | 7 | 7 | 5 | 7 | 6 | 8 | |
| CONTROL | 16 | 5 | 5 | 6 | 4 | 4 | 6 | 7 | |
| COLORED | 17 | 8 | 8 | 4 | 10 | 8 | 10 | 8 | |
| COLORED | 18 | 4 | 7 | 8 | 8 | 8 | 10 | 4 | |
| COLORED | 19 | 6 | 6 | 8 | 5 | 8 | 5 | 7 | |
| CONTROL | 20 | 5 | 6 | 8 | 4 | 6 | 5 | 6 | |
| WHITE | 21 | 5 | 5 | 3 | 8 | 6 | 5 | 5 | |
| WHITE | 22 | 5 | 5 | 5 | 6 | 5 | 6 | 5 | |
| CONTROL | 23 | 6 | 6 | 7 | 5 | 3 | 3 | 4 | |
| COLORED | 24 | 8 | 9 | 5 | 8 | 9 | 4 | 5 | |
| WHITE | 25 | 8 | 10 | 9 | 9 | 4 | 8 | 6 | |
| CONTROL | 26 | 5 | 8 | 7 | 6 | 8 | 5 | 6 | |
| COLORED | 27 | 7 | 7 | 6 | 8 | 6 | 4 | 9 | |
| WHITE | 28 | 7 | 7 | 11 | 8 | 8 | 8 | 10 | |
| CONTROL | 29 | 8 | 5 | 6 | 4 | 4 | 4 | 4 | |
| COLORED | 30 | 7 | 7 | 7 | 5 | 7 | 5 | 6 | |
| WHITE | 31 | 8 | 5 | 9 | 7 | 5 | 7 | 8 | |
| CONTROL | 32 | 8 | 12 | 2 | 10 | 7 | 11 | 6 | |
| CONTROL TOTAL | | 64 | 68 | 65 | 60 | 57 | 60 | 60 | |
| WHITE TOTAL | | 62 | 62 | 62 | 64 | 56 | 62 | 55 | |
| COLORED TOTAL | | 69 | 74 | 64 | 68 | 75 | 64 | 63 | |
| CONTROL MEAN | | 5.82 | 6.18 | 5.91 | 5.45 | 5.18 | 5.45 | 5.45 | |
| WHITE MEAN | | 6.20 | 6.20 | 6.20 | 6.40 | 5.60 | 6.20 | 5.50 | |
| COLORED MEAN | | 6.27 | 6.73 | 5.82 | 6.18 | 6.82 | 5.82 | 5.73 | |

SUBSTITUTE SHEET

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| LAYING TABLE | | GROUP NO. | 17/03 | 18/03 | 19/03 | 20/03 | 21/03 | 22/03 | 23/03 | 24/03 | SUMMARY |
|--------------|-----------|-----------|-------|-------|-------|-------|-------|-------|-------|---------|---------|
| GROUP TYPE/ | GROUP NO. | 17/03 | 18/03 | 19/03 | 20/03 | 21/03 | 22/03 | 23/03 | 24/03 | SUMMARY | |
| CONTROL | 1 | 4 | 6 | 8 | 6 | 6 | 7 | 6 | 6 | 5 | 45.07% |
| WHITE | 2 | 5 | 7 | 8 | 3 | 3 | 6 | 6 | 6 | 4 | 37.93% |
| COLOR | 3 | 4 | 6 | 6 | 4 | 6 | 5 | 5 | 4 | 4 | 39.41% |
| CONTROL | 4 | 5 | 4 | 7 | 4 | 6 | 5 | 7 | 7 | 7 | 38.92% |
| WHITE | 5 | 5 | 2 | 3 | 4 | 6 | 5 | 4 | 4 | 3 | 25.37% |
| COLOR | 6 | 9 | 6 | 4 | 6 | 7 | 6 | 5 | 5 | 5 | 39.16% |
| CONTROL | 7 | 5 | 5 | 8 | 5 | 3 | 4 | 4 | 4 | 5 | 35.71% |
| WHITE | 8 | 2 | 5 | 6 | 3 | 1 | 4 | 5 | 5 | 5 | 31.28% |
| COLOR | 9 | 5 | 5 | 3 | 5 | 3 | 5 | 4 | 4 | 4 | 32.02% |
| CONTROL | 10 | 2 | 5 | 3 | 5 | 5 | 3 | 6 | 6 | 3 | 30.30% |
| WHITE | 11 | 6 | 7 | 9 | 7 | 5 | 8 | 8 | 8 | 7 | 48.03% |
| COLOR | 12 | 3 | 3 | 3 | 4 | 3 | 3 | 5 | 5 | 3 | 25.86% |
| CONTROL | 13 | 8 | 7 | 5 | 8 | 2 | 7 | 7 | 7 | 6 | 43.35% |
| WHITE | 14 | 5 | 8 | 7 | 5 | 8 | 6 | 7 | 7 | 4 | 41.63% |
| COLOR | 15 | 7 | 6 | 6 | 6 | 6 | 8 | 8 | 7 | 5 | 44.83% |
| CONTROL | 16 | 3 | 4 | 5 | 4 | 7 | 4 | 5 | 5 | 7 | 33.50% |
| COLOR | 17 | 8 | 6 | 5 | 7 | 8 | 6 | 6 | 6 | 7 | 50.49% |
| CONTROL | 18 | 9 | 7 | 9 | 6 | 8 | 8 | 8 | 9 | 10 | 49.75% |
| COLOR | 19 | 4 | 8 | 6 | 9 | 5 | 7 | 6 | 6 | 6 | 44.33% |
| CONTROL | 20 | 7 | 10 | 4 | 8 | 8 | 7 | 7 | 8 | 5 | 44.33% |

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| LAYING TABLE (Continued) | | 17/03 | 18/03 | 19/03 | 20/03 | 21/03 | 22/03 | 23/03 | 24/03 | SUMMARY |
|--------------------------|-----------------|-------|-------|-------|-------|-------|-------|-------|-------|---------|
| GROUP | TYPE/ GROUP NO. | | | | | | | | | |
| WHITE | 21 | 8 | 5 | 3 | 4 | 6 | 7 | 5 | 5 | 39.90% |
| WHITE | 22 | 5 | 4 | 5 | 4 | 4 | 2 | 4 | 6 | 34.24% |
| CONTROL | 23 | 3 | 6 | 3 | 8 | 6 | 7 | 3 | 5 | 34.24% |
| COLORED | 24 | 5 | 8 | 6 | 6 | 7 | 6 | 5 | 6 | 47.29% |
| WHITE | 25 | 8 | 8 | 8 | 6 | 7 | 7 | 8 | 6 | 54.93% |
| CONTROL | 26 | 4 | 7 | 6 | 6 | 4 | 7 | 6 | 5 | 43.60% |
| COLORED | 27 | 8 | 8 | 5 | 6 | 7 | 6 | 7 | 6 | 49.26% |
| WHITE | 28 | 7 | 8 | 6 | 6 | 7 | 5 | 6 | 8 | 52.46% |
| CONTROL | 29 | 5 | 9 | 9 | 3 | 4 | 2 | 5 | 5 | 37.93% |
| COLORED | 30 | 6 | 6 | 7 | 5 | 8 | 7 | 7 | 5 | 41.87% |
| WHITE | 31 | 6 | 8 | 7 | 4 | 7 | 7 | 7 | 5 | 47.78% |
| CONTROL | 32 | 7 | 9 | 8 | 9 | 5 | 6 | 5 | 6 | 54.43% |
| TOTAL CONTROL | | 53 | 72 | 66 | 66 | 56 | 59 | 62 | 59 | 61.79 |
| TOTAL WHITE | | 57 | 62 | 62 | 46 | 51 | 57 | 60 | 53 | 57.90 |
| TOTAL COLORED | | 68 | 69 | 60 | 64 | 68 | 67 | 65 | 61 | 65.00 |
| CONTROL MEAN | | 4.82 | 6.55 | 6.00 | 6.00 | 5.09 | 5.36 | 5.64 | 5.36 | 5.62 |
| WHITE MEAN | | 5.70 | 6.20 | 6.20 | 4.60 | 5.10 | 5.70 | 6.00 | 5.30 | 5.79 |
| COLORED MEAN | | 6.18 | 6.27 | 5.45 | 5.82 | 6.18 | 6.09 | 5.91 | 5.55 | 5.91 |

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APPENDIX B

| UNIT TYPE / UNIT NO. | 24/02 | 27/02 | 03/03 | 06/03 | 10/03 | 13/03 | 17/03 | 20/03 | 24/03 | DATE |
|----------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------|
| CONTROL | 375 | 450 | 650 | 475 | 300 | 450 | 300 | 475 | 375 | |
| WHITE | 325 | 250 | 475 | 500 | 525 | 350 | 375 | 200 | 300 | |
| COLORED | 375 | 400 | 525 | 575 | 400 | 325 | 300 | 300 | 275 | |
| CONTROL | 400 | 275 | 300 | 275 | 300 | 300 | 350 | 275 | 500 | |
| WHITE | 385 | 225 | 150 | 350 | 225 | 225 | 325 | 300 | 225 | |
| COLORED | 450 | 365 | 275 | 375 | 450 | 450 | 625 | 500 | 375 | |
| CONTROL | 475 | 215 | 300 | 250 | 450 | 275 | 275 | 350 | 325 | |
| WHITE | 250 | 550 | 475 | 350 | 275 | 400 | 150 | 200 | 325 | |
| COLORED | 135 | 400 | 425 | 425 | 425 | 375 | 375 | 400 | 325 | |
| CONTROL | 350 | 425 | 375 | 375 | 350 | 500 | 150 | 350 | 215 | |
| WHITE | 650 | 350 | 650 | 575 | 650 | 450 | 425 | 500 | 500 | |
| COLORED | 150 | 250 | 350 | 225 | 325 | 300 | 200 | 300 | 175 | |
| CONTROL | 315 | 475 | 525 | 450 | 500 | 500 | 575 | 575 | 425 | |
| WHITE | 450 | 375 | 325 | 375 | 475 | 475 | 400 | 350 | 300 | |
| COLORED | 215 | 350 | 500 | 575 | 625 | 400 | 500 | 450 | 375 | |
| CONTROL | 375 | 400 | 350 | 475 | 400 | 275 | 225 | 275 | 525 | |
| COLORED | 575 | 450 | 425 | 525 | 625 | 800 | 600 | 525 | 575 | |
| COLORED | 500 | 400 | 425 | 350 | 325 | 525 | 625 | 475 | 725 | |
| COLORED | 225 | 575 | 575 | 650 | 425 | 325 | 300 | 650 | 450 | |
| CONTROL | 650 | 300 | 350 | 400 | 375 | 250 | 400 | 600 | 350 | |

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APPENDIX B (continued)

| UNIT TYPE / UNIT NO. | 24/02 | 27/02 | 03/03 | 06/03 | 10/03 | 13/03 | 17/03 | 20/03 | 24/03 | DATE |
|----------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|---------|
| WHITE 21 | 375 | 500 | 550 | 425 | 275 | 575 | 550 | 300 | 385 | |
| WHITE 22 | 425 | 150 | 425 | 325 | 350 | 425 | 350 | 300 | 425 | |
| CONTROL 23 | 275 | 375 | 225 | 250 | 375 | 275 | 200 | 550 | 350 | |
| COLORED 24 | 475 | 300 | 625 | 550 | 550 | 575 | 325 | 450 | 450 | |
| WHITE 25 | 200 | 650 | 750 | 575 | 575 | 625 | 550 | 400 | 425 | |
| CONTROL 26 | 350 | 500 | 350 | 450 | 350 | 400 | 300 | 425 | 415 | |
| COLORED 27 | 475 | 500 | 575 | 600 | 475 | 600 | 550 | 450 | 475 | |
| WHITE 28 | 375 | 700 | 625 | 625 | 475 | 575 | 475 | 450 | 575 | |
| CONTROL 29 | 400 | 375 | 425 | 400 | 600 | 250 | 375 | 225 | 350 | |
| COLORED 30 | 300 | 450 | 500 | 375 | 575 | 400 | 500 | 475 | 375 | |
| WHITE 31 | 515 | 525 | 500 | 450 | 625 | 500 | 475 | 275 | 375 | |
| CONTROL 32 | 825 | 650 | 475 | 1000 | 525 | 750 | 500 | 650 | 450 | SUMMARY |
| CONTROL TOTAL | 4790 | 4440 | 4325 | 4800 | 4525 | 4225 | 3650 | 4750 | 4280 | 4421 |
| WHITE TOTAL | 3950 | 4275 | 4925 | 4550 | 4450 | 4600 | 4075 | 3275 | 3835 | 4215 |
| COLORED TOTAL | 3875 | 4440 | 5200 | 5225 | 5200 | 5075 | 4900 | 4975 | 4575 | 4829 |
| CONTROL MEAN | 68.43 | 72.79 | 66.54 | 72.73 | 70.70 | 70.42 | 68.87 | 71.97 | 72.54 | 70.55 |
| WHITE MEAN | 73.15 | 73.71 | 71.38 | 70.00 | 71.77 | 71.88 | 71.49 | 71.20 | 72.36 | 71.88 |
| COLORED MEAN | 67.98 | 70.48 | 73.24 | 73.59 | 75.36 | 74.63 | 72.06 | 77.73 | 75.00 | 73.34 |

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APPENDIX C[09/03] MEAN DAILY FOOD CONSUMED

| <u>UNIT TYPE /</u> | <u>FOOD GIVEN</u> | <u>FOOD REMAINING</u> | <u>MEAN FOOD CONSUMED</u> |
|--------------------|-------------------|-----------------------|---------------------------|
| CONTROL | 21450 | 641 | 114.34 |
| WHITE | 21450 | 768 | 113.64 |
| COLORLED | 21450 | 773 | 113.61 |

[23/03]

| <u>UNIT TYPE /</u> | <u>FOOD GIVEN</u> | <u>FOOD REMAINING</u> | <u>MEAN DAILY FOOD CONSUMED</u> |
|--------------------|-------------------|-----------------------|---------------------------------|
| CONTROL | 21450 | 443 | 115.42 |
| WHITE | 21450 | 605 | 114.53 |
| COLORLED | 21450 | 555 | 114.81 |

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APPENDIX D

| DIVISION OF EGGS PER GROUP PER DAY | | DATE | | | | | | | | | |
|------------------------------------|----------------|-------|-------|-------|-------|-------|-------|-------|---|--|--|
| UNIT | TYPE/ UNIT NO. | 25/03 | 26/03 | 27/03 | 28/03 | 29/03 | 30/03 | 31/03 | | | |
| CONTROL | 1 | 4 | 7 | 7 | 4 | 4 | 5 | 5 | 4 | | |
| WHITE | 2 | 7 | 3 | 3 | 8 | 6 | 5 | 2 | 5 | | |
| RED | 3 | 2 | 7 | 7 | 3 | 3 | 4 | 5 | 5 | | |
| CONTROL | 4 | 4 | 5 | 5 | 8 | 7 | 6 | 6 | 5 | | |
| WHITE | 5 | 5 | 4 | 4 | 4 | 3 | 4 | 3 | 4 | | |
| BLUE | 6 | 4 | 4 | 4 | 7 | 6 | 6 | 6 | 9 | | |
| CONTROL | 7 | 4 | 4 | 4 | 4 | 2 | 3 | 3 | 3 | | |
| WHITE | 8 | 3 | 4 | 4 | 4 | 7 | 5 | 5 | 5 | | |
| BLUE | 9 | 5 | 5 | 3 | 6 | 2 | 4 | 4 | 2 | | |
| CONTROL | 10 | 5 | 6 | 6 | 3 | 7 | 4 | 3 | 3 | | |
| WHITE | 11 | 4 | 2 | 2 | 5 | 2 | 6 | 7 | 7 | | |
| RED | 12 | 4 | 8 | 8 | 3 | 2 | 3 | 3 | 3 | | |
| CONTROL | 13 | 4 | 4 | 7 | 3 | 6 | 5 | 5 | 4 | | |
| WHITE | 14 | 5 | 5 | 9 | 6 | 6 | 6 | 5 | 8 | | |
| BLUE | 15 | 8 | 3 | 3 | 4 | 5 | 7 | 4 | 8 | | |
| CONTROL | 16 | 3 | 10 | 7 | 5 | 4 | 4 | 6 | 5 | | |
| BLUE | 17 | 6 | 7 | 7 | 6 | 9 | 8 | 6 | 6 | | |
| RED | 18 | 7 | 7 | 7 | 7 | 9 | 8 | 9 | 8 | | |
| BLUE | 19 | 7 | 5 | 5 | 5 | 7 | 6 | 6 | 6 | | |
| CONTROL | 20 | 6 | 4 | 4 | 6 | 9 | 8 | 8 | 6 | | |

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APPENDIX D

| DIVISION OF EGGS PER GROUP PER DAY (Continued) | | | | | | | | | | | | |
|--|-------|----------|-------|-------|-------|-------|-------|-------|-------|------|--|--|
| UNIT | TYPE/ | UNIT NO. | 25/03 | 26/03 | 27/03 | 28/03 | 29/03 | 30/03 | 31/03 | DATE | | |
| WHITE | | 21 | 6 | 5 | 7 | 4 | 5 | 4 | 3 | | | |
| WHITE | | 22 | 2 | 5 | 6 | 6 | 6 | 6 | 7 | | | |
| CONTROL | | 23 | 5 | 5 | 3 | 3 | 4 | 3 | 3 | | | |
| BLUE | | 24 | 9 | 5 | 5 | 4 | 5 | 5 | 8 | | | |
| WHITE | | 25 | 7 | 5 | 8 | 7 | 6 | 8 | 8 | | | |
| CONTROL | | 26 | 5 | 5 | 6 | 3 | 5 | 5 | 7 | | | |
| RED | | 27 | 6 | 4 | 8 | 6 | 6 | 7 | 5 | | | |
| WHITE | | 28 | 8 | 5 | 4 | 7 | 6 | 8 | 5 | | | |
| CONTROL | | 29 | 4 | 4 | 6 | 5 | 5 | 7 | 5 | | | |
| RED | | 30 | 6 | 6 | 4 | 3 | 5 | 3 | 5 | | | |
| WHITE | | 31 | 5 | 8 | 6 | 8 | 7 | 6 | 6 | | | |
| CONTROL | | 32 | 7 | 9 | 10 | 5 | 7 | 8 | 5 | | | |
| CONTROL TOTAL | | | 51 | 57 | 58 | 53 | 54 | 60 | 50 | | | |
| WHITE TOTAL | | | 54 | 52 | 58 | 61 | 56 | 54 | 58 | | | |
| BLUE TOTAL | | | 43 | 34 | 33 | 33 | 36 | 30 | 39 | | | |
| RED TOTAL | | | 24 | 26 | 25 | 23 | 26 | 27 | 26 | | | |
| CONTROL MEAN | | | 4.64 | 5.18 | 5.27 | 4.82 | 4.91 | 5.45 | 4.55 | | | |
| WHITE MEAN | | | 5.40 | 5.20 | 5.80 | 6.10 | 5.60 | 5.40 | 5.80 | | | |
| BLUE MEAN | | | 7.17 | 5.67 | 5.50 | 5.50 | 6.00 | 5.00 | 6.50 | | | |
| RED MEAN | | | 4.80 | 5.20 | 5.00 | 4.60 | 5.20 | 5.40 | 5.20 | | | |

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| DIVISION OF EGGS PER GROUP PER DAY | | | | | | | | | | | | |
|------------------------------------|-------|-------|-------|-------|-------|-------|-------|---------|--|--|--|--|
| UNIT TYPE /UNIT NO. | 01/04 | 02/04 | 03/04 | 04/04 | 05/04 | 06/04 | 07/04 | SUMMARY | | | | |
| CONTROL | 1 | 5 | 6 | 4 | 5 | 3 | 8 | 6 | | | | |
| WHITE | 2 | 8 | 4 | 4 | 5 | 4 | 5 | 5 | | | | |
| RED | 3 | 6 | 3 | 5 | 8 | 4 | 5 | 6 | | | | |
| CONTROL | 4 | 5 | 6 | 3 | 5 | 7 | 7 | 4 | | | | |
| WHITE | 5 | 4 | 4 | 6 | 5 | 2 | 3 | 5 | | | | |
| BLUE | 6 | 4 | 5 | 5 | 5 | 8 | 6 | 4 | | | | |
| CONTROL | 7 | 5 | 5 | 3 | 2 | 3 | 3 | 5 | | | | |
| WHITE | 8 | 6 | 4 | 5 | 6 | 3 | 6 | 4 | | | | |
| BLUE | 9 | 5 | 8 | 3 | 3 | 4 | 3 | 4 | | | | |
| CONTROL | 10 | 4 | 1 | 6 | 4 | 3 | 3 | 3 | | | | |
| WHITE | 11 | 2 | 9 | 6 | 10 | 5 | 7 | 7 | | | | |
| RED | 12 | 2 | 0 | 4 | 3 | 3 | 4 | 3 | | | | |
| CONTROL | 13 | 6 | 5 | 10 | 4 | 7 | 5 | 5 | | | | |
| WHITE | 14 | 5 | 7 | 7 | 7 | 8 | 7 | 4 | | | | |
| BLUE | 15 | 3 | 6 | 7 | 4 | 7 | 5 | 5 | | | | |
| CONTROL | 16 | 2 | 5 | 7 | 2 | 5 | 7 | 4 | | | | |
| BLUE | 17 | 9 | 6 | 11 | 6 | 8 | 9 | 8 | | | | |
| RED | 18 | 7 | 10 | 8 | 9 | 7 | 6 | 8 | | | | |
| BLUE | 19 | 6 | 4 | 4 | 7 | 7 | 3 | 7 | | | | |
| CONTROL | 20 | 7 | 5 | 6 | 6 | 10 | 7 | 3 | | | | |

SUBSTITUTE SHEET

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| DIVISION OF EGGS PER GROUP PER DAY (Continued) | | | | | | | | | |
|--|-------|-------|-------|-------|-------|-------|-------|---------|------|
| UNIT TYPE / UNIT NO. | 01/04 | 02/04 | 03/04 | 04/04 | 05/04 | 06/04 | 07/04 | SUMMARY | |
| WHITE 21 | 6 | 4 | 5 | 6 | 7 | 3 | 6 | 5.07 | 6 |
| WHITE 22 | 5 | 5 | 4 | 2 | 8 | 5 | 8 | 5.36 | 8 |
| CONTROL 23 | 5 | 4 | 2 | 4 | 5 | 5 | 3 | 3.86 | 3 |
| BLUE 24 | 7 | 6 | 9 | 7 | 7 | 5 | 7 | 6.36 | 7 |
| WHITE 25 | 4 | 9 | 8 | 10 | 13 | 6 | 11 | 7.86 | 11 |
| CONTROL 26 | 6 | 5 | 3 | 5 | 2 | 6 | 2 | 4.64 | 2 |
| RED 27 | 6 | 6 | 7 | 5 | 5 | 8 | 7 | 6.14 | 7 |
| WHITE 28 | 6 | 7 | 8 | 6 | 6 | 5 | 7 | 6.29 | 7 |
| CONTROL 29 | 3 | 4 | 6 | 7 | 3 | 5 | 6 | 5.00 | 6 |
| RED 30 | 4 | 6 | 6 | 2 | 5 | 8 | 5 | 4.86 | 5 |
| WHITE 31 | 6 | 3 | 9 | 5 | 7 | 4 | 8 | 6.29 | 8 |
| CONTROL 32 | 8 | 9 | 7 | 7 | 8 | 6 | 5 | 7.21 | 5 |
| TOTAL CONTROL | 56 | 55 | 57 | 51 | 56 | 62 | 46 | 54.71 | 46 |
| TOTAL WHITE | 52 | 56 | 62 | 62 | 63 | 51 | 65 | 57.43 | 65 |
| TOTAL BLUE | 34 | 35 | 39 | 32 | 41 | 31 | 35 | 35.36 | 35 |
| TOTAL RED | 25 | 25 | 30 | 27 | 24 | 31 | 29 | 26.29 | 29 |
| MEAN CONTROL | 5.09 | 5.00 | 5.18 | 4.64 | 5.09 | 5.64 | 4.18 | 4.97 | 4.18 |
| MEAN WHITE | 5.20 | 5.60 | 6.20 | 6.20 | 6.30 | 5.10 | 6.50 | 5.74 | 6.50 |
| MEAN BLUE | 5.67 | 5.83 | 6.50 | 5.33 | 6.83 | 5.17 | 5.83 | 5.89 | 5.83 |
| MEAN RED | 5.00 | 5.00 | 6.00 | 5.40 | 4.80 | 6.20 | 5.80 | 5.26 | 5.80 |

SUBSTITUTE SHEET

APPENDIX E

| [07/041] | | |
|-----------|-------------|--|
| UNIT TYPE | /FOOD GIVEN | /FOOD REMAINING/AVERAGE AMOUNT OF FOOD EATEN BY CHICKENS |
| CONTROL | 21450 | 1973 |
| WHITE | 21450 | 1913 |
| BLUE | | |
| RED | | |
| | | 107.02 |
| | | 107.35 |
| | 21450 | 2254 |
| | 21450 | 1470 |
| | | 105.47 |
| | | 109.78 |

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APPENDIX F

DIVISION OF THE WEIGHT OF EGGS PER GROUP PER DAY

| UNIT TYPE / UNIT NO. | 27/03 | 31/03 | 03/04 | 07/04 | DATE |
|----------------------|-------|-------|-------|-------|---------|
| CONTROL 1 | 300 | 275 | 275 | 415 | |
| WHITE 2 | 575 | 350 | 275 | 325 | |
| RED 3 | 215 | 375 | 325 | 400 | |
| CONTROL 4 | 575 | 335 | 215 | 275 | |
| WHITE 5 | 275 | 325 | 450 | 375 | |
| BLUE 6 | 525 | 675 | 375 | 285 | |
| CONTROL 7 | 225 | 125 | 225 | 300 | |
| WHITE 8 | 275 | 350 | 385 | 275 | |
| BLUE 9 | 425 | 150 | 250 | 275 | |
| CONTROL 10 | 215 | 215 | 400 | 225 | |
| WHITE 11 | 325 | 500 | 425 | 500 | |
| RED 12 | 225 | 200 | 275 | 235 | |
| CONTROL 13 | 225 | 275 | 715 | 375 | |
| WHITE 14 | 425 | 535 | 425 | 300 | |
| BLUE 15 | 285 | 575 | 525 | 385 | |
| CONTROL 16 | 400 | 335 | 525 | 300 | |
| BLUE 17 | 450 | 465 | 800 | 600 | |
| RED 18 | 450 | 575 | 575 | 525 | |
| BLUE 19 | 350 | 450 | 300 | 500 | |
| CONTROL 20 | 400 | 425 | 425 | 215 | |
| WHITE 21 | 475 | 200 | 335 | 425 | |
| WHITE 22 | 450 | 485 | 250 | 550 | |
| CONTROL 23 | 200 | 215 | 125 | 200 | |
| BLUE 24 | 375 | 625 | 650 | 525 | |
| WHITE 25 | 550 | 550 | 550 | 725 | |
| CONTROL 26 | 425 | 475 | 200 | 150 | |
| RED 27 | 575 | 335 | 525 | 485 | |
| WHITE 28 | 275 | 335 | 575 | 500 | |
| CONTROL 29 | 450 | 335 | 435 | 450 | |
| RED 30 | 285 | 350 | 450 | 350 | |
| WHITE 31 | 400 | 425 | 675 | 575 | |
| CONTROL 32 | 700 | 365 | 500 | 365 | SUMMARY |
| TOTAL CONTROL | 4115 | 3375 | 4040 | 3270 | 3700 |
| TOTAL WHITE | 4025 | 4055 | 4345 | 4550 | 4244 |
| TOTAL BLUE | 2410 | 2940 | 2900 | 2570 | 2705 |
| TOTAL RED | 1750 | 1835 | 2150 | 1995 | 1933 |
| CONTROL MEAN | 70.95 | 67.50 | 70.88 | 71.09 | 70.10 |
| WHITE MEAN | 69.40 | 69.91 | 70.08 | 70.00 | 69.85 |
| BLUE MEAN | 73.03 | 75.38 | 74.36 | 73.43 | 74.05 |
| RED MEAN | 70.00 | 70.58 | 71.67 | 68.79 | 70.26 |

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APPENDIX GOne Factor ANOVA X_1 :Column 1 Y_2 :Column 3

Comparison: Mean Diff.: Fisher PLSD: Scheffe F-test: Dunnett t:

| | | | | |
|---------------|---------|----------|-------|-------|
| Group 1 vs. 2 | 347.367 | 367.466 | 1.25 | 1.937 |
| Group 1 vs. 3 | 449.167 | 313.376* | 2.874 | 2.936 |
| Group 1 vs. 4 | 433.985 | 307.988* | 2.778 | 2.887 |
| Group 2 vs. 3 | 101.8 | 332.386 | .131 | .627 |
| Group 2 vs. 4 | 86.618 | 327.311 | .098 | .542 |

* Significant at 95%

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APPENDIX HOne Factor ANOVA X_1 :Column 1 Y_2 :Column 3

Comparison: Mean Diff.: Fisher PLSD: Scheffe F-test: Dunnett t:

| | | | | |
|---------------|---------|----------|--------|-------|
| Group 1 vs. 2 | 115.682 | 231.428 | .523 | 1.022 |
| Group 1 vs. 3 | 316.545 | 225.851* | 4.109* | 2.867 |
| Group 2 vs. 3 | 200.864 | 231.428 | 1.576 | 1.775 |

* Significant at 95%

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APPENDIX I

RAW DATA

| | % MORTALITY Y ₁ | expt condition X ₁ | Column 3 initial no of layers | Column 4 final no of layers |
|----|-------------------------------|-------------------------------------|-------------------------------------|-----------------------------------|
| 1 | 0 | EX | 15 | 15 |
| 2 | 5.900 | EX | 17 | 16 |
| 3 | 11.100 | EX | 18 | 16 |
| 4 | 11.100 | EX | 18 | 16 |
| 5 | 0 | EX | 18 | 18 |
| 6 | 0 | EX | 18 | 18 |
| 7 | 11.100 | EX | 18 | 16 |
| 8 | 5.600 | EX | 18 | 17 |
| 9 | 0 | EX | 11 | 11 |
| 10 | 0 | EX | 11 | 11 |
| 11 | 20.000 | EX | 10 | 8 |
| 10 | 0 | EX | 17 | 17 |
| 13 | 5.900 | EX | 17 | 16 |
| 14 | 11.800 | EX | 17 | 15 |
| 15 | 0 | EX | 18 | 18 |
| 16 | 5.600 | EX | 18 | 17 |
| 17 | 11.100 | EX | 18 | 16 |
| 18 | 11.100 | EX | 18 | 16 |
| 19 | 5.900 | EX | 17 | 16 |
| 20 | 8.300 | EX | 12 | 11 |
| 21 | 0 | EX | 12 | 12 |
| 22 | 11.100 | CON | 18 | 16 |
| 23 | 22.200 | CON | 18 | 14 |
| 24 | 11.100 | CON | 18 | 16 |
| 25 | 5.600 | CON | 18 | 17 |
| 26 | 11.100 | CON | 18 | 16 |
| 27 | 11.100 | CON | 18 | 16 |
| 28 | 11.100 | CON | 18 | 16 |
| 29 | 16.700 | CON | 18 | 15 |
| 30 | 18.200 | CON | 11 | 9 |
| 31 | 15.400 | CON | 13 | 11 |
| 32 | 13.300 | CON | 15 | 13 |
| 33 | 6.300 | CON | 16 | 15 |
| 34 | 16.700 | CON | 18 | 15 |
| 35 | 22.200 | CON | 18 | 14 |
| 36 | 16.700 | CON | 18 | 15 |
| 37 | 5.600 | CON | 18 | 17 |
| 38 | 11.100 | CON | 18 | 16 |
| 39 | 11.800 | CON | 17 | 15 |
| 40 | 6.300 | CON | 16 | 15 |
| 41 | 16.700 | CON | 12 | 10 |
| 42 | 0 | CON | 10 | 10 |

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One Factor ANOVA X_1 :Column 1 Y_1 :Column 2

Analysis of Variance Table

| Source: | DF: | Sum Squares: | Mean Square: | F-test: |
|----------------|-----|--------------|--------------|-----------------|
| Between groups | 1 | 439.087 | 439.087 | 13.574 |
| Within groups | 40 | 1293.872 | 32.347 | $p = 7.0000E-4$ |
| Total | 41 | 1732.959 | | |

Model II estimate of between component variance = 406.74

1

One Factor ANOVA X_1 :Column 1 Y_1 :Column 2

| Group: | Count: | Mean: | Std. Dev.: | Std. Error: |
|--------|--------|--------|------------|-------------|
| EX | 21 | 5.929 | 5.715 | 1.247 |
| CON | 21 | 12.395 | 5.66 | 1.235 |

2

One Factor ANOVA X_1 :Column 1 Y_1 :Column 2

| Comparison: | Mean Diff.: | Fisher PLSD: | Scheffe F-test: | Dunnnett t: |
|-------------|-------------|--------------|-----------------|-------------|
| EX vs. CON | -6.467 | 3.548* | 13.574* | 3.684 |

*Significant at 95%

3

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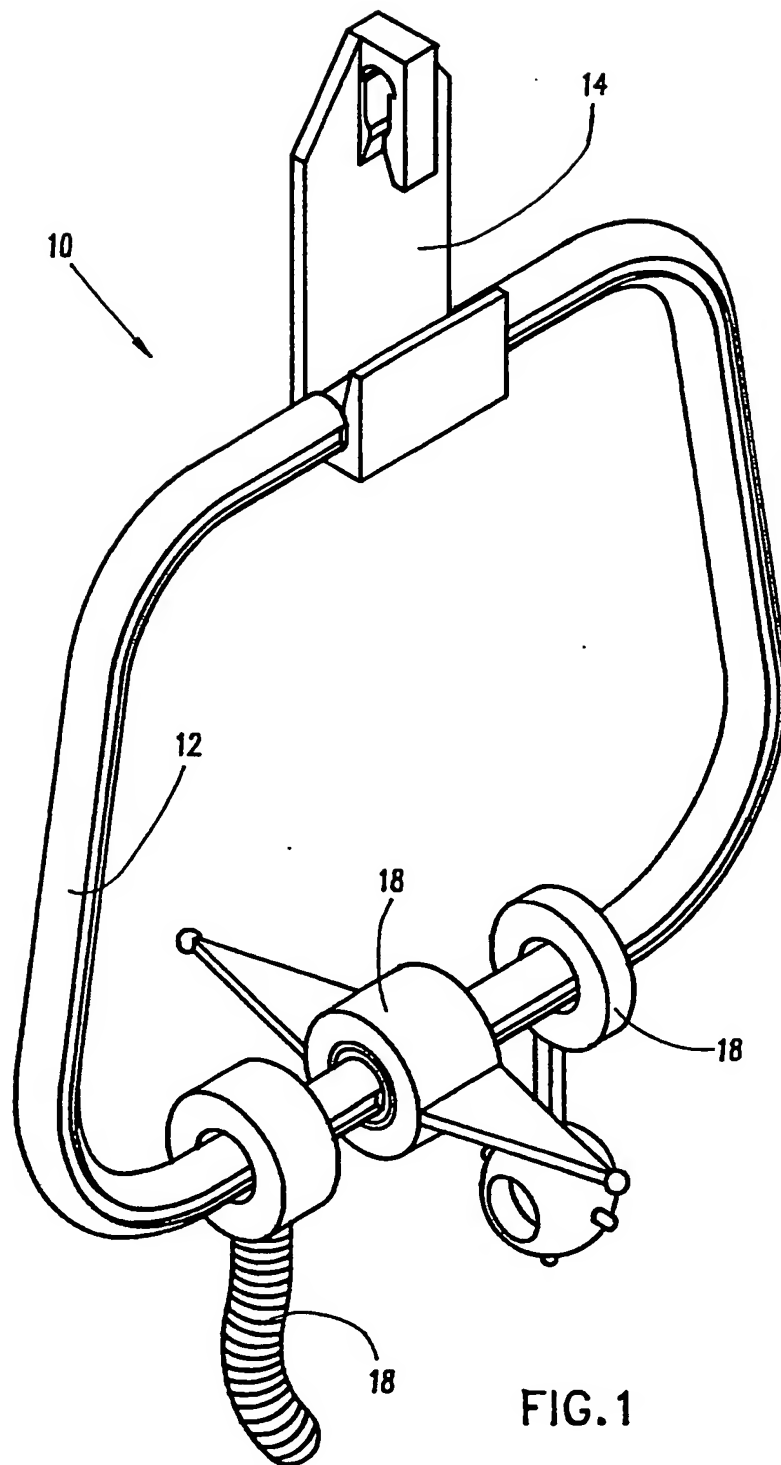
It will be appreciated by persons skilled in the art that the present invention is not limited to what has been particularly shown and described hereinabove. Rather, the scope of the present invention is defined only by the claims that follow:

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C L A I M S

1. A farm animal toy comprising:
a colored structure suitable for
stimulating at least one farm animal characterized
5 in that the color of the colored structure is
selected so as to significantly improve at least
one measure of the output of at least one farm
animal.
2. A farm animal toy according to claim 1,
10 wherein at least one farm animal is a layer and the
at least one measure of the output of the farm
animal comprises at least one of the following
group:
egg weight;
15 egg mass;
life expectancy; and
number of eggs laid.
3. A farm animal toy according to claim 1 or
claim 2, wherein the color of the colored structure
20 is selected from among colors well perceived by the
farm animal.
4. A farm animal toy according to claim 2,
wherein a substantial portion of the colored
structure is blue.
- 25 5. A farm animal toy according to claim 4,
wherein the frame of the colored structure is blue.
6. A farm animal toy according to claim 4 or
claim 5, wherein the color of at least one portion
of the colored structure is red.
- 30 7. A farm animal toy according to any of
claims 4-6, wherein the color of at least one
portion of the colored structure is white.



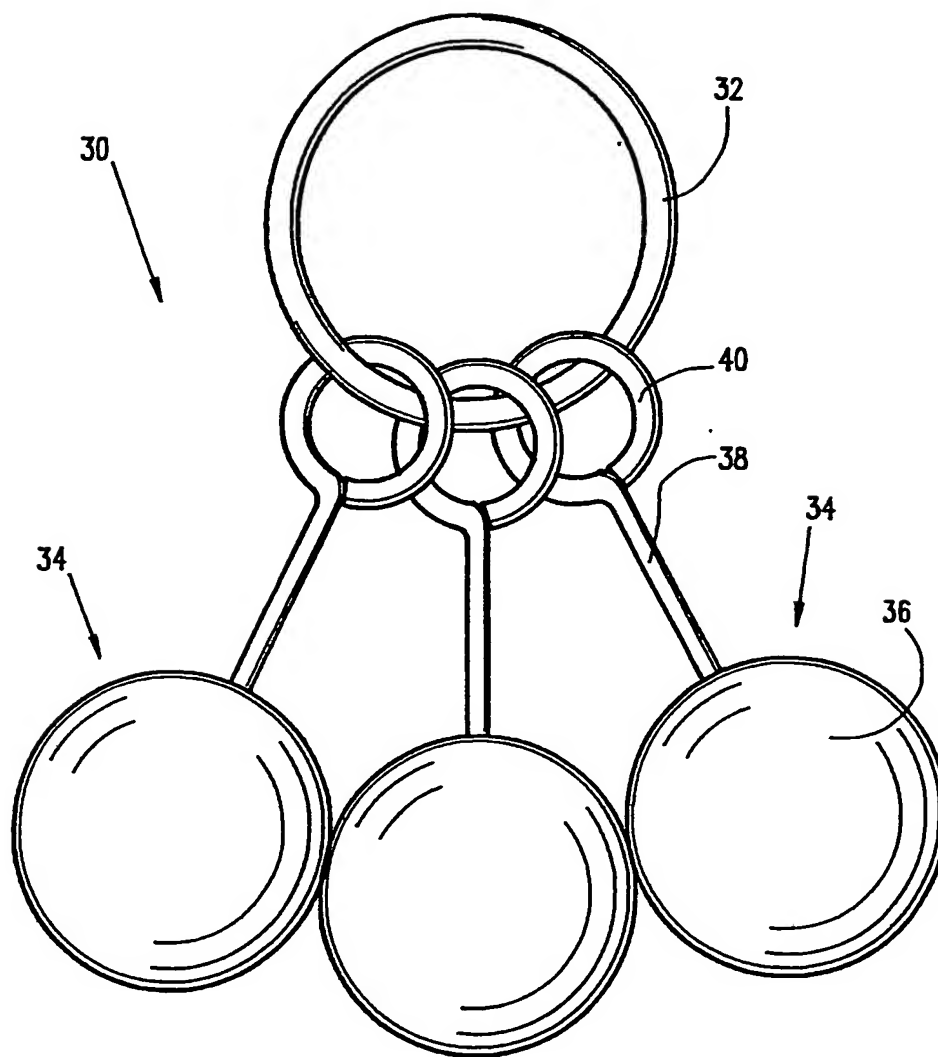


FIG. 2

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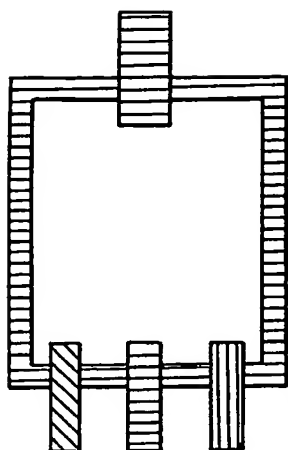


FIG. 3A

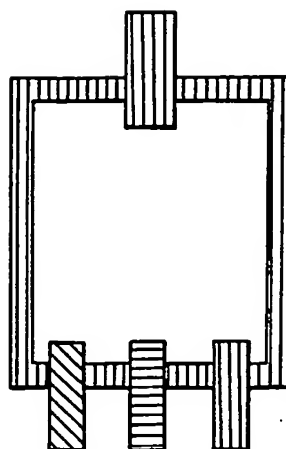


FIG. 3B

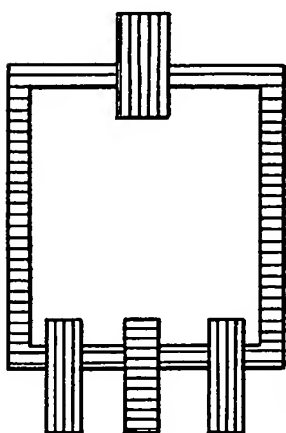


FIG. 4A

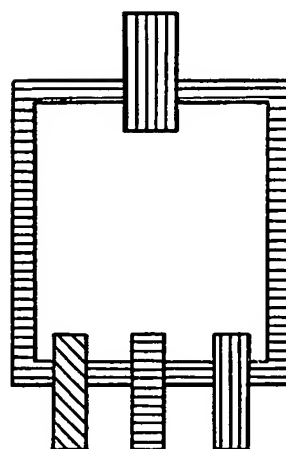


FIG. 4B

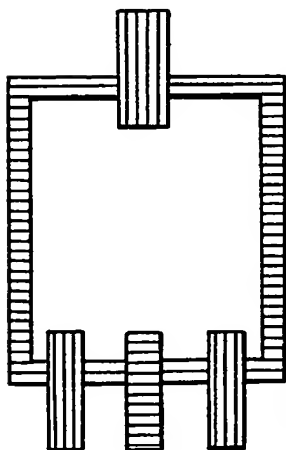


FIG. 5A

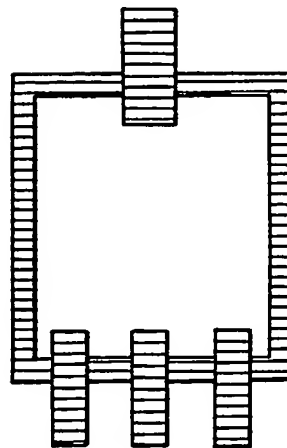


FIG. 5B

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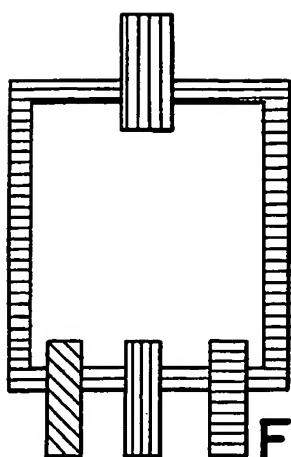


FIG. 6A

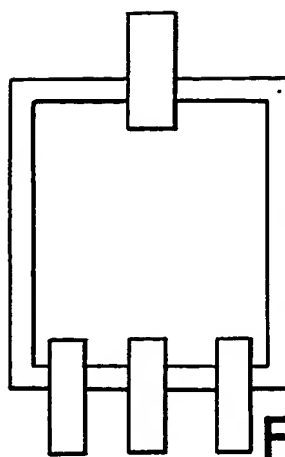


FIG. 6B

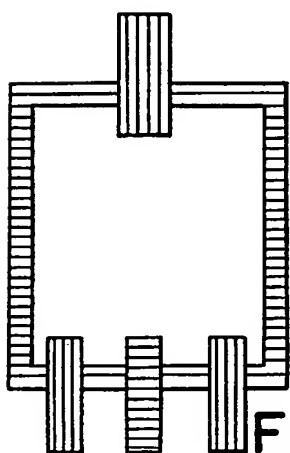


FIG. 7A

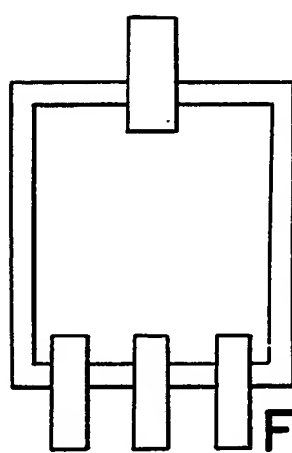


FIG. 7B

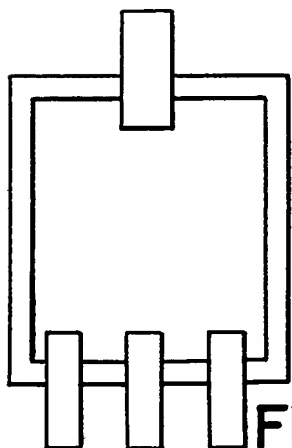


FIG. 8A

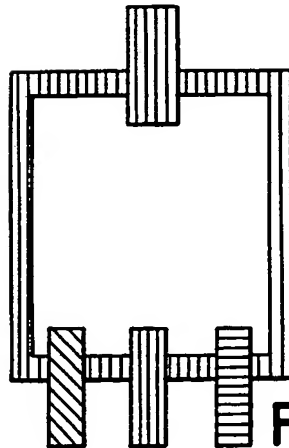


FIG. 8B

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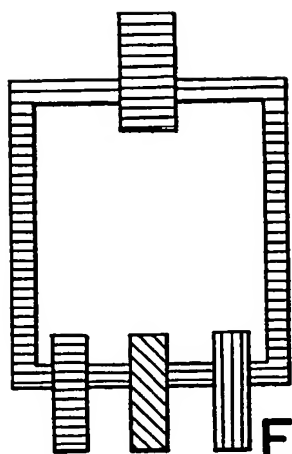


FIG. 9A

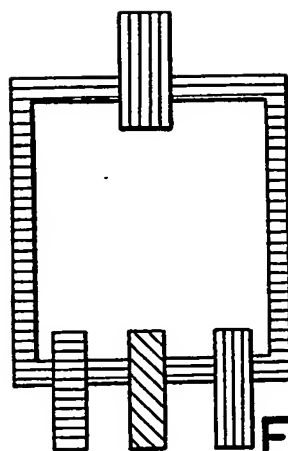


FIG. 9B

INTERNATIONAL SEARCH REPORT

PCT/US92/06492

A. CLASSIFICATION OF SUBJECT MATTER

IPC(S) :A01K 29/00

US CL :119/29

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 119/29, 6.8, 70, 174, 45.1, 21, 22; 446/227, 491, 419; 606/234, 235

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|---------------|--|-----------------------|
| <u>X</u> Y | US, A, 5,010,851 (Gvaryahu et al) 30 April 1991, See column 3, line 37 to column 5, line 18 and claims 1,3, and 7. | <u>1-6</u> 7 |
| <u>X</u> Y | US, A, 4,993,363 (Gvaryahu) 19 February 1991, See column 2, lines 6-42 and claims 5-6. | <u>1-6</u> 7 |
| Y | US, A, 4,542,714 (Ingraham et al) 24 September 1985, See entire document. | 1-7 |
| <u>X</u> Y | US, A, 4,913,092 (Gvaryahu et al) 03 April 1990, See column 2, lines 30-49 and claims 1,2 and 5. | <u>1-6</u> 7 |

☒ Further documents are listed in the continuation of Box C.
 ☐ See patent family annex.

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Date of the actual completion of the international search

08 JANUARY 1993

Date of mailing of the international search report

19 JAN 1993

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INTERNATIONAL SEARCH REPORT

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|-----------|--|-----------------------|
| Y | GB, A, 250,875 (Dawson) 22 April 1926, See page 2, lines 2-5. | 1-7 |
| Y | GB, A, 103,141 (Childs) 10 January 1917, See page 2, line 39 to page 3, line 13. | 1-7 |
| A | US, A, 4,625,728 (Schonberg) 02 December 1986. | 1-7 |

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